UUI: Reusable Spatial Data Services in Unified User Interface at NASA GES DISC

http://disc.gsfc.nasa.gov/uui/

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GES DISC is a data center that provides access to large-scale archives of earth science data.

Also applications and services built on top of the data.
Going forward

Unified User Interface

Context (space, time, data, keywords...)

Information | Visualization | Subset | Search

Data

GUI

Data Services

Data Archive
Unified User Interface (UUI)

Search/find/navigate ANY DATA RESOURCE, while retaining CONTEXT for cross-resource SEAMLESS NAVIGATION:

- Data granules
- Data subsets (in bulk)
- Data visualization in/from Giovanni
- Data Documentation
- Dataset Landing Pages

**Unified User Interface (UUI)**

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### Data Collections

**Refine By**

**Subject** Sort →
- Atmospheric Chemistry (20)
- Atmospheric Pressure (14)
- Atmospheric Radiation (124)
- Atmospheric Temperature (145)
- Barometric Altitude (144)
- Cloud Properties (118)
- Evapotranspiration (8)
- Geopotential Height (18)
- Heat Flux (124)

**Measurement** Sort →
- Models/Analyses MERRA (215)
- Models/Analyses MERRA 2 (89)
- Models/Analyses MERRA-2 (2)
- Models/Analyses Noah-LSM (3)

**Source** Sort →
- MERRA-2 const_2d_ctm_Nx: Constant Model Parameters for Usage by CTM V5.12.4 (M2C01XCTM.5.12.4) - Atmospheric Temperature
- MERRA-2 const_2d_Idx_Nx: 2d, constants Land Surface Diagnostics V5.12.4 (M2C01XNSD.5.12.4) - Atmospheric Temperature
- tavg1_2d_mld_Nx: MERRA Simulated 2D Incremental Analysis Update (IAU) MERRA-Land reanalysis, GEOGids-MERRAland, Time Average 1-hourly V5.2.0 (MST1NXMD.5.2.0) - Clouds, Atmospheric Radiation, Atmospheric Water Vapor
- tavgM_2d_mld_Nx: MERRA Simulated 2D Incremental

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### Related Documentation

Showing 1 - 32 of 316 datasets associated with merra for date range 1920-01-01 to 2016-06-01

<table>
<thead>
<tr>
<th>Image</th>
<th>Dataset</th>
<th>Source</th>
<th>Temporal Resolution</th>
<th>Spatial Resolution</th>
<th>Process Level</th>
<th>Begin Date</th>
<th>End Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hover</td>
<td>MERRA-2 const_2d_ctm_Nx: Constant Model Parameters for Usage by CTM V5.12.4 (M2C01XCTM.5.12.4) - Atmospheric Temperature</td>
<td>Models/Analyses MERRA-2</td>
<td>1 constant</td>
<td>0.5° x 0.625°</td>
<td>4</td>
<td>1980-01-01</td>
<td>present</td>
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<td>1 hour</td>
<td>1.25° x 1.25°</td>
<td>4</td>
<td>1979-01-01</td>
<td>present</td>
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<tr>
<td>Hover</td>
<td>tavgM_2d_mld_Nx: MERRA Simulated 2D Incremental</td>
<td>Models/Analyses MERRA</td>
<td>1 month</td>
<td>1.25° x 1.25°</td>
<td>4</td>
<td>2020-01-01</td>
<td>present</td>
</tr>
</tbody>
</table>
Data access and available services
Services

- Build around a notion of web services
  - Small, self-contained, web-accessible building blocks
  - Can be reused and chained to build more complex services

- Each service provides a well-defined specification
  - Allows for an easy verification, integration, maintenance
  - JSON WSP as a main vehicle, enhanced based on …
  - OpenSearch / GEO and OGC WPS recommendations

- Legacy services wrapped in JSON WSP
Architecture

Web Page → AngularJS

User Actions → AngularJS

Content View

AngularJS → Node.js

JSON WSP request → Node.js

JSON WSP response → AngularJS

Node.js

Query → JSON WSP

JS Objects

Mongo DB

Web Server, Built-in services

Legacy Service wrappers

OPeNDAP
SSW
Giovanni

Legacy metadata

Metadata

CMR,
**Specification**

```
{ "type": "jsonwsp/description",
  "version": "1.0",
  "servicename": "Keywords service",
  "url": "http://disc.gsfc.nasa.gov/uui/service/keywords/jsonwsp",
  "methods": {
    "getSynonyms": {
      "doc_lines": ["Returns synonyms"]
    },
    "params": {
      "keyword": {
        "doc_lines": ["a keyword"],
        "type": "string",
        "optional": false
      }
    },
    "ret_info": {
      "type": ["string"]
    }
  }
}
```

**Request (POST)**

```
{ "type": "jsonwsp/request",
  "version": "1.0",
  "methodname": "getSynonyms",
  "args": {
    "keyword": "AOD"
  }
}
```

**Response**

```
{ "type": "jsonwsp/response",
  "version": "1.0",
  "servicename": "Keywords service",
  "method": "getSynonyms",
  "result": ["AOT", "Aerosol Optical Depth"]
}
```

- Request params named based on OpenSearch/GEO
  - start, end, box, etc
- Response is formatted based on OpenSearch as well
  - totalResults, startIndex, items etc.
Service interaction – OGC WPS

WSP Client
- Execute (Request)
- Return (Result)

WSP Server
- Create Job
- Run Job

Synchronous Job
Source: OGC® WPS 2.0 Interface Standard

Asynchronous Job
- Execute (Request)
- Return (StatusInfo)
- GetStatus (JobID)
- Return (StatusInfo)
- GetResult (JobID)
- Return (Result)
- Update results
Service composition and reuse

• Services are simple POST calls with parameters in => results out
• Easy to wrap as a function in many languages supporting JSON (JavaScript, Python, Perl, etc.)
• Wrapper function can be used as a building block to construct complex services
  • ... Search for data
  • Then Subset the data
  • Then Process the data
  • Then Plot the data ...
Reuse by External Clients

- Easy for external clients to consume services and build composite applications
- Don’t need to know internal protocols and APIs of GES DISC applications
- Implement a single API - use with any service
Challenges and limitations

- Lack of means for automatic discovery and reuse in JSON WSP
  - Lacks semantic information (some relief in OpenSearch GEO)
  - Can’t specify acceptable required/optional combinations for args
  - Needs better customization

- Rigid communication protocol in OGC WPS
  - Does not specify retrieval of intermediate results
  - Can not process / display results of long-running jobs until complete (no piping)
Summary

• New interface provides a simple and modern user experience, replacing and integrating with a number of legacy data services and applications at GES DISC

• Service-based implementation takes advantage of modern technologies and standards
  • High maintainability, evolvability, and forward compatibility

• Services are easy to reuse by partner applications
  • Search, Subset, Regrid, Format
  • Visualization (coming soon)